

GENERAL DESIGN CRITERIA FOR DRINKING WATER SYSTEMS

Surface Water Supplies

1. Raw Water Intake -- the intake must be screened and capable of taking water from several levels.
2. All water supplies treating water from surface sources, such as impoundments, rivers, streams and springs, must be given complete treatment. This includes the following:
 - Rapid Mix – detention time not to exceed one minute.
 - Flocculation – detention time 40 to 60 minutes.
 - Settling – standard basin should have a detention time of four hours; if tube settlers are used, a detention time of approximately two hours is acceptable.
 - Filtration--
 - Slow sand: may be used for small supplies at a filter rate of two gallons per 25 square feet per minute.
 - Rapid sand: may be used at filtration rate of two gal/ft²/min. with a backwash rate of 15 gal/ft²/min. The effective size of the filter sand must be between 0.45 mm and 0.55 mm with a uniformity coefficient of 1.7mm.
 - High-rate filtration: the filter media, dual or mixed, must be of an approved type. Filtration rates up to 5 gpm/ft² are allowed if continuous turbidity monitoring is provided for each filter effluent.
3. Clear Well -- must have a volume of 15 percent of the total 24-hour plant capacity and must be properly equipped with a vent, overflow and hatch.
4. Surface water supplies using raw water sources, such as impounded reservoirs, lakes and ponds, must observe all requirements as listed in No. 2 above for surface water supplies. The exception is that up-flow clarifiers may be used instead of settling basins with four hours' detention time. If the turbidity in such bodies of water runs less than 30 ppm year-round, an up-flow rate of 1.25 gpm/ft² per minute must be used in the up-flow clarifier. If turbidity exceeds 30 ppm, an up-flow of 0.75 gpm/ft² must be used in the clarifier. If there is a wide fluctuation of turbidity in such water, a 0.75 gpm/ft² rate must be used.
5. Chlorination -- pre- and/or post-chlorination must be provided with gas-type chlorinator or electrically operated, positive displacement solution chlorinator. If gas chlorination is used, the following safety steps must be taken:
 - (a) The chlorinator and chlorine supply must be located in a separate, special room.
 - (b) The room must be properly vented with an outside exit.
 - (c) Scales must be provided.
 - (d) An observation window must be provided.
 - (e) A gas mask approved by the Bureau of Mines must be provided and stored outside the chlorination room.
 - (f) A free residual of at least 0.2 ppm must be maintained throughout the system.

Groundwater Supplies

1. Well supplies must be provided with automatic chlorination. Gas-type chlorinator or electrically operated, positive displacement solution type must be used. A minimum of 30 minutes' contact time between the water and the chlorine must be provided.
2. If the iron content in the well water exceeds 0.3 ppm and the manganese exceeds 0.05 ppm, iron and manganese removal should be provided by an iron and manganese removal filter. When excessive amounts of iron are present of over 3.0 ppm, aeration with 30-minute contact basin followed by pressure filtration is recommended in preference to iron removal filter. Pressure filters may be used only in the treatment of well supplies.
3. The well must not be located within 50 feet of septic tanks and 70 feet from drain fields or near any other known source of contamination. No sewer pipes are to be installed within 20 feet of the well.
4. If the hardness is in excess of 125 ppm, softening is recommended.
5. Water with nitrates in excess of 10 ppm (as N) and chlorides of 250 ppm should not be used.
6. If a well is subject to turbidity, complete treatment must be given as described in No. 2 above under "Surface Water Supplies."
7. Wells must be provided with a sanitary seal.
8. A minimal pressure of 30 PSI must be available on the discharge side of all meters.